

**IN THE CLAIMS:**

1           1. (Currently Amended) A method for programming a pattern matching engine  
2     having a plurality of information storage entries with one or more regular expressions,  
3     each regular expression including a plurality of characters and ~~having each regular ex-~~  
4     ~~pression defining a corresponding action to be applied to~~ when matching strings are  
5     found, the method comprising the steps of:  
6           identifying one or more borders within a ~~given~~ regular expression, the one or  
7     more borders separating the ~~given~~ regular expression into a plurality of sub-expressions,  
8     at least one sub-expression having a plurality of sequential characters; and  
9           loading one or more entries of the pattern matching engine with a plurality of the  
10    sequential characters from ~~at least~~ more than one sub-expression, wherein the borders are  
11    defined by a predetermined sequence of regular expression metacharacters, the entries  
12    stored in content addressable memory (CAM) and  
13    determining if the plurality of sequential characters from more than one sub-  
14    expression matches a string, and if so, then  
15    executing the corresponding action associated with that matched string.

1           2. (currently amended) The method of claim 1 wherein the predetermined se-  
2     quence of regular expression metacharacters is a first regular expression metacharacter  
3     defined to match any one character followed immediately by a second regular expression  
4     metacharacter defined to match the ~~preceeding~~ one character zero, one, or more times.

1           3. (currently amended) The method of claim 1 further comprising ~~the a~~ step of or-  
2     ganizing at least part of the pattern matching engine into a plurality of sections, and  
3     wherein each section of the pattern matching engine is loaded with a plurality of search  
4     patterns for a corresponding sub-expression.

1           4. (currently amended) The method of claim 3 wherein the entries of a ~~given~~-sec-  
2   tion are loaded with a search pattern that includes a complete match of ~~the~~ a respective  
3   sub-expression, a search pattern that includes a partial match of ~~the~~ a respective sub-  
4   expression, and a mismatch pattern.

1           5. (currently amended) The method of claim 4 further comprising the steps of:  
2           associating at least one sub-expression with a current state variable; and  
3           loading the associated current state variable into each entry of ~~the~~ a section of the  
4   pattern matching engine that contains the at least one sub-expression.

1           6. (Original) The method of claim 5 wherein the pattern matching engine has at  
2   least one content addressable memory (CAM) loaded with the one or more regular ex-  
3   pressions.

1           7. (currently amended) The method of claim 6 wherein  
2           the CAM is a ternary content addressable memory, a TCAM, that supports don't  
3   care values, and  
4           each regular expressions loaded to the CAM is ~~loaded as~~ has a plurality of search  
5   patterns including a mismatch pattern having ~~all~~-don't care values.

1           8. (currently amended) A method for programming a pattern matching engine  
2   having a plurality of information storage entries with one or more regular expressions,  
3   each regular expression including a plurality of characters and ~~having each regular ex-~~  
4   pression defining a corresponding action to be applied ~~to~~ when matching strings are  
5   found, the method comprising the steps of:

6 identifying one or more borders within a ~~given~~ regular expression, the one or  
7 more borders separating the given regular expression into a plurality of sub-expressions  
8 wherein at least one sub-expression has a plurality of sequential characters;

9 defining one or more search patterns for each sub-expression having one or more  
10 borders containing a predetermined sequence of regular expression metacharacters, the  
11 predetermined sequence of regular expression metacharacters containing a first regular  
12 expression metacharacter defined to match any one character followed immediately by a  
13 second regular expression metacharacter defined to match the ~~preceding one~~ character  
14 zero, one, or more times;

15 including at the pattern matching engine at least one ternary content addressable  
16 memory (TCAM) for loading one or more regular expressions and supporting don't care  
17 values, and a second memory device having a plurality of entries for loading actions cor-  
18 responding to the one or more regular expressions;

19 organizing at least part of the TCAM into a plurality of sections wherein each sec-  
20 tion of the TCAM is loaded with a plurality of search patterns for a sub-expression, the  
21 plurality of search patterns includes a complete match pattern of ~~the respective~~ a sub-  
22 expression, a partial match pattern of the respective sub-expression, and a mismatch pat-  
23 tern including ~~all~~ don't care values,

24 determining if the plurality of sequential characters from more than one sub-  
25 expression matches a string, and if so, then  
26 executing the corresponding action associated with that matched string.  
27

1           9. (Original) The method of claim 8 wherein each entry of the TCAM identifies a  
2       corresponding entry of the second memory device.

1           10. (currently amended) The method of claim 9 wherein at least one TCAM entry  
2       is associated with a next state variable, the method further comprising the step of loading  
3       ~~the~~ an entry of the second memory device that is identified by the at least one TCAM  
4       entry with the associated next state variable.

1           11. (currently amended) The method of claim 10 wherein  
2       the at least one TCAM entry is located in a TCAM section whose entries are as-  
3       sociated with a current state variable having a first value, and  
4       the next state variable has a second value that differs from the first value, ~~thereby~~  
5       wherein the next state variable specifies ~~specifying~~ a new TCAM section to be searched.

1           12. (Original) The method of claim 11 wherein each TCAM entry has a match  
2       cell that contains the complete match, the partial match or the mismatch pattern.

1           Claims 13-20. (Canceled)

1           21. (Previously Presented) The method of claim 1 wherein  
2       each regular expression is associated with an action,  
3       the pattern matching engine further includes a second memory device having a  
4       plurality of entries, and  
5       the entries of the second memory device are loaded with the actions associated  
6       with the one or more regular expressions.

1           22. (currently amended) A method for programming a pattern matching engine  
2       having a plurality of information storage entries with one or more regular expressions,  
3       each regular expression including a plurality of characters and ~~having~~ each regular ex-

4 | pression defining a corresponding action to be applied to when matching strings are  
5 | found, the method comprising the steps of:

6 |       including at the pattern matching engine at least one ternary content addressable  
7 | memory (TCAM) that supports don't care values, the TCAM loaded with the one or more  
8 | regular expression; and

1 |       including a second memory device having a plurality of entries for loading actions  
2 | corresponding to the one or more regular expressions wherein each entry of the TCAM  
3 | identifies a corresponding entry of the second memory device,

4 |       determining that the plurality of sequential characters from more than one sub-  
5 | expression matches a string, and

6 |       executing the corresponding action associated with that matched string.  
7 |

1 |       23. (Previously Presented) The method of claim 22 wherein at least one TCAM  
2 | entry is associated with a next state variable, the method further comprising the step of  
3 | loading the entry of the second memory device that is identified by the at least one  
4 | TCAM entry with the associated next state variable.

1 |       24. (Previously Presented) The method of claim 23 wherein  
2 |       the at least one TCAM entry is located in a TCAM section whose entries are as-  
3 | sociated with a current state variable having a first value, and  
4 |       the next state variable has a second value that differs from the first value, thereby  
5 | specifying a new TCAM section to be searched.

1 |       25. (Previously Presented) The method of claim 24 wherein each TCAM entry  
2 | has a match cell that contains the complete match, the partial match or the mismatch pat-  
3 | tern.

26. (currently amended) ~~A switch~~Apparatus comprising:

means for programming a pattern matching engine having a plurality of information storage entries with one or more regular expressions, each regular expression including a plurality of characters and each regular expression defining a corresponding action to be applied when matching strings are found~~having a corresponding action to be applied to matching strings~~;

means for identifying one or more borders within a ~~given~~ regular expression, the one or more borders separating the given regular expression into a plurality of sub-expressions, at least one sub-expression having a plurality of sequential characters; and

means for loading one or more entries of the pattern matching engine with a plurality of the sequential characters from ~~at least~~more than one sub-expression, the entries stored in content addressable memory (CAM),

means for determining if the plurality of sequential characters from more than one sub-expression matches a string, and if so, then

means for executing the corresponding action associated with that matched string.

27. (currently amended) The ~~switch~~apparatus of claim 26, further comprising:

means for organizing at least part of the CAM into a plurality of sections, and wherein each section of the CAM is loaded with a plurality of search patterns for a corresponding sub-expression.

28. (currently amended) The ~~apparatus~~switch of claim 26, further comprising:

means for associating at least one sub-expression with a current state variable; and

means for loading the associated current state variable into each entry of the CAM that contains the at least one sub-expression.

1 | 29. (currently amended) The ~~apparatus~~switch of claim 26, further comprising:  
2 | means for associating each regular expression with an action;  
3 | means for including at the pattern matching engine a memory device having a  
4 | plurality of entries;  
5 | means for loading the memory device with the actions associated with the one or  
6 | more regular expressions.

1 | 30. (currently amended) The ~~apparatus~~switch of claim 26, further comprising:  
2 | means for using a ternary content addressable memory (TCAM) for the CAM,  
3 | each entry of the TCAM identifying a corresponding entry of the memory device.

1 | 31. (currently amended) A ~~switch~~Apparatus comprising:  
2 | a pattern matching engine having a plurality of information storage entries con-  
3 | figured to program one or more regular expressions, each regular expression including a  
4 | plurality of characters and having a corresponding action to be applied to matching  
5 | strings;  
6 | the pattern matching engine configured to identify one or more borders within a  
7 | given regular expression, the one or more borders separating the given regular expression  
8 | into a plurality of sub-expressions, at least one sub-expression having a plurality of se-  
9 | quential characters; the pattern matching engine configured to determine that the plurality  
10 | of sequential characters from more than one sub-expression matches a string, and if there  
11 | is a matched string,  
12 | then execute the corresponding action associated with that matched string, and  
13 | a content addressable memory (CAM), the CAM configured to store a plurality of  
14 | the sequential characters from at least one sub-expression.

1        32. (currently amended) The apparatus~~switch~~ of claim 31, further comprising:  
2        at least part of the CAM organized into a plurality of sections wherein each sec-  
3        tion is loaded with a plurality of search patterns for a corresponding sub-expression.

1        33. (currently amended) The apparatus~~switch~~ of claim 31, further comprising:  
2        the pattern matching engine configured to associate at least one sub-expression  
3        with a current state variable; and  
4        the pattern matching engine configured to store the associated current state vari-  
5        able into each CAM entry that contains the at least one sub-expression.

1        34. (currently amended) The apparatus~~switch~~ of claim 31, further comprising:  
2        a memory device having a plurality of entries;  
3        the memory device configured to store actions associated with the one or more  
4        regular expressions.

1        35. (currently amended) The ~~switch~~appartus of claim 31, further comprising:  
2        the CAM configured as a ternary content addressable memory (TCAM), the  
3        TCAM storing a corresponding entry for each entry of the second memory device.